

# **RSVP at BNL**

**Presented to  
The DOE Review of  
RSVP Activities at BNL**

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# Goals of the Experimental Program Using the RHIC/AGS Accelerator Complex

1. Operate the RHIC-AGS complex to obtain the full scientific benefit of the flagship *relativistic heavy ion and spin physics program* of the Office of Nuclear Physics
  - operate the accelerator complex to maximize cost/benefit for physics
  - maintain and incrementally upgrade the machines & RHIC experiments
2. Extend the operations of the machine complex to benefit other scientific work
  - BLIP produces key research isotopes by using the Linac proton beam
  - Tandem supplies low energy ion beams for specialty needs of customers
  - Booster now supplies ion & proton beams for NASA's radiobiology program
  - AGS has run SEB & FEB beams in the RHIC era for DOE HEP & NP exps.
  - AGS has also run beams for NASA and NNSC for their programs
3. Continue technical development of the RHIC-AGS machine complex for all users
  - perfect development of pulse-on-demand (PPM) flexibility among machines
  - replace the Tandem ion source with EBIS to increase cost-effectiveness
  - add electron cooling in RHIC heavy ion beams to increase average luminosity
  - in the long run, add fast AGS cycling with new SC Linac and 2.5 Hz PS

# Realization of the RHIC/AGS Goals

- RHIC is the endpoint of a chain of accelerators:

HI: Tandem  
p↑: OPPIS → Linac } → *Booster* → *AGS* → RHIC (blue and yellow rings)

[machines shown in *red italics* shared by RHIC and AGS programs]

- Injector machines are needed by RHIC for only a fraction of their cycle time
  - RHIC requires reloading after 3-4 hours (Au beams) or 8-10 hours (protons); reloading now takes 1.0 hours (could be as short as 10 minutes in the future)
  - AGS cycles at 3-5 secs/cycle (FEB/SEB); uses *Booster* only for injection
  - *Booster* available for NSRL beams 90% of the time when feeding AGS
  - One Tandem is typically available during RHIC HI running (except d-Au runs)
  - FEB/SEB users in AGS share the *Booster* & *AGS* with RHIC HI and share the Linac, *Booster* & *AGS* with RHIC p↑ running
- The Linac-*Booster*-AGS chain is available for AGS experiments ~100 hrs/week
  - E949 SEB running in 2002 demonstrated compatibility with RHIC operations
  - some earlier technical restrictions have now been mitigated (T. Roser talk)
  - availability will go up for RSVP with advent of *pulse-on-demand (PPM)*
  - *incremental costs* are applied in WFO, yielding large cost benefits for NSF

# Charge and Purpose of This Review

- The ONP Charge to this review has as its central focus:  
*“In particular, the review committee should assess the **risks and impacts** (both positive and negative) of the proposed RSVP construction project and RSVP operations on the RHIC accelerator complex and RHIC nuclear physics program at BNL, including other ongoing work-for-others activities that utilize the RHIC accelerator complex such as the NASA Space Radiation Laboratory. This assessment should include NSF expectations of **beam time for the RSVP program** and identify the **incremental costs** to NSF for this running time.”* plus “Because NSF is also considering sponsorship of the continuation of AGS experiment E949 under equivalent administrative conditions, we intend to consider the RHIC program impacts of this experiment in the same review, using the same tools.”
- BNL will present and discuss, in detail, the RSVP impacts, beam time and costs
  - white papers distributed by email to the reviewers on January 16
  - plenary talks by Lowenstein, Desmarais (DOE-BAO), Pile and Roser
  - parallel discussion sessions on accelerator and experiments impacts
- This review is *NOT* a forum for substantive review of the following NSF topics:
  - the cost baseline for the RSVP MRE-FC Project
  - management plans and project organizations for RSVP
  - project schedules for RSVP (except as these generally interact with RHIC)

# RSVP Connections to BNL Management

- DOE-NSF Memorandum of Understanding
  - the inter-agency basis for operating the AGS for NSF-sponsored exps.
  - based upon the NASA BAF/NSRL model for construction & operations
  - essentials will be presented for DOE-BAO by R. Desmarais
- Relationship to the DOE Nuclear Physics Mission of RHIC
  - RHIC-AGS complex use respects *primacy of the nuclear physics mission*
  - although there will be both positive and negative impacts, BNL expects to demonstrate that the *positive impacts will dominate* for RSVP (& other WFO)
  - successful concurrent operation of AGS with RHIC has already been demonstrated (E949 first run in 2002)
- Role of the BNL ALD-HENP
  - approval of the RHIC and AGS scientific programs, with HENP PAC advice
  - BNL line responsibility for successful evolution of the RHIC and AGS programs, including their scientific productivity, ESSH performance and the fiscal and management performance of the involved BNL Departments & Divisions as they carry out the HENP mission here
  - BNL management oversight for the RSVP (E949) construction and operations phases for DOE and NSF; NSF oversight will include the BNL Laboratory Oversight Committee (LOC), chaired by the ALD-HENP